

appeared and navigation opened. Harbor Springs, Mich., 20th, ice passed out of bay; 24th, harbor clear of ice; 25th, harbor and bay frozen over. Milwaukee, Wis., 12th, navigation opened. Green Bay, Wis., 8th, river clear of ice; 11th, the bay is clear of ice; 31st, first boat arrived, opening navigation.

Lake Ontario.—Oswego, N. Y., 30th, the schooner *Julia*, from Kingston, Ont., arrived to-day and opened navigation for the season.

Lake Superior.—Two Harbors, Minn., 16th, the harbor of the lake practically clear of ice at this point.

OBSERVATIONS ON THE GREAT LAKES.

Owing to the close of navigation on the Great Lakes during the winter season the Weather Bureau has received no reports from vessels for the month of March, and from only one U. S. Life-Saving station.

SUNSHINE AND CLOUDINESS.

SUNSHINE.

During the month an instrumental record of the amount of sunshine has been kept at 15 stations by means of the photographic sunshine recorder and at 21 stations by means of the thermometric sunshine recorder; the results of these observations are given in Table IV, which shows the actual percentage of sunshine received on the average of the month for any hour of local mean time (not seventy-fifth mean time).

The stations recording the largest percentage of sunshine between the hours of 11 a. m. and 1 p. m., are: Colorado Springs, Colo., 86.0; Denver, Colo., 82.5; Detroit, Mich., 81.5; Dodge City, Kans., 81.0; Key West, Fla., 86.5; Saint Louis, Mo., 86.5; Santa Fe, N. Mex., 81.5; Vicksburg, Miss., 86.0.

The stations having the least percentage during these hours, are: Portland, Oreg., 23; Cleveland, Ohio, 54; Cincinnati, Ohio, 55.

The general average sunshine for the whole month is given in the next to the last column of Table IV. The highest percentages are: Key West, Fla., 82; Santa Fe, N. Mex., 77; St. Louis, Mo., 75; Dodge City, Kans., Denver, Colo., and Tucson, Ariz., 74; Kansas City, Mo., 70. The lowest percentages are: Portland, Oreg., 24; Salt Lake City, Utah, 53; Chicago, Ill., 52; Buffalo, N. Y., 53; Galveston, Tex., 54; New Orleans, La., 55.

CLOUDINESS.

The number of clear and cloudy days and the average cloudiness between sunrise and sunset, as based on numerous personal observations, are given for each Weather Bureau station in Table I. The complement of this average cloudiness gives the observer's estimated percentage of clear sky, and these latter numbers are given in the last column of Table IV. On the average these personal estimates of clear sky are lower by about 8 per cent than the sunshine as recorded by the thermometric registers and lower by 11 per cent than the sunshine recorded by photographic registers.

GENERAL REMARKS.

The quantity of direct sunshine received at any station is approximately shown by the self-recording sunshine registers

which work either by photography or by thermometry. The quantity of direct sunshine, or blue sky light, received at the same station is approximately shown by the estimated cloudiness, and the complement of this number is an approximate value of the average amount of sunshine received by the surrounding country, as distinguished from the station itself. As has been explained in previous WEATHER REVIEWS there is no necessary agreement between the local sunshine register and the observer's estimate of the cloudiness of the sky. In the following table there are brought together, side by side, the instrumental records of the percentage of duration of sunshine and the observer's personal estimate of the percentage of area of the sky covered by clouds, and, in accord with the results of previous months, it is seen that the differences are rather larger for comparatively clear skies but smaller for cloudy skies:

Difference between instrumental and personal observations of sunshine.

| Station. | Photographic register. | | | Station. | Thermometric register. | | |
|---------------------|------------------------|-----------|-------------|-------------------------|------------------------|-----------|-------------|
| | Instrumental. | Personal. | Difference. | | Instrumental. | Personal. | Difference. |
| Santa Fe, N. Mex. | 77 | 63 | 14 | Key West, Fla. | 82 | 62 | 20 |
| Dodge City, Kans. | 74 | 62 | 12 | St. Louis, Mo. | 75 | 64 | 11 |
| Tucson, Ariz. | 74 | 59 | 15 | Colorado Springs, Colo. | 68 | 50 | 18 |
| Denver, Colo. | 74 | 49 | 25 | Philadelphia, Pa. | 68 | 47 | 21 |
| Kansas City, Mo. | 70 | 65 | 5 | Vicksburg, Miss. | 66 | 65 | 1 |
| Savannah, Ga. | 69 | 60 | 9 | Baltimore, Md. | 66 | 57 | 9 |
| Washington, D. C. | 63 | 60 | 3 | Detroit, Mich. | 66 | 45 | 21 |
| Memphis, Tenn. | 61 | 58 | 3 | Columbus, Ohio. | 64 | 45 | 19 |
| Cleveland, Ohio. | 59 | 45 | 14 | Wilmington, N. C. | 62 | 64 | 2 |
| San Francisco, Cal. | 57 | 53 | 4 | Des Moines, Iowa. | 62 | 51 | 11 |
| Cincinnati, Ohio. | 56 | 51 | 5 | Portland, Me. | 62 | 45 | 17 |
| Galveston, Tex. | 54 | 54 | 0 | New Haven, Conn. | 61 | 40 | 21 |
| Portland, Oreg. | 24 | 25 | 1 | Louisville, Ky. | 60 | 47 | 13 |
| Eastport, Me. | 35 | | | New York, N. Y. | 60 | 46 | 14 |
| San Diego, Cal. | 62 | | | Little Rock, Ark. | 60 | 45 | 15 |
| | | | | Boston, Mass. | 60 | 41 | 19 |
| | | | | New Orleans, La. | 55 | 54 | 1 |
| | | | | Salt Lake City, Utah. | 53 | 40 | 13 |
| | | | | Buffalo, N. Y. | 53 | 39 | 14 |
| | | | | Chicago, Ill. | 52 | 51 | 1 |
| | | | | Rochester, N. Y. | | 41 | |

NOTES BY THE EDITOR.

OLD RECORDS OF COLD WEATHER IN MARYLAND.

In connection with the disastrous cold weather of the latter part of March, the voluntary observer, Mr. A. E. Acworth, of Mardela Springs (formerly Barren Creek Springs), Wicomico Co., Md., communicates the following extracts from old records kept by the late Dr. Ker, at Princess Anne, Somerset Co., Md., from 1823 to 1849, which show the dates in March of each successive year on which temperature fell to 32°, or below, also the recorded temperature itself in degrees; the dates on which frost, ice, or snow occurred are also given:

1823.—Temperature, 1st, 24; 4th, 28. Frost, 9th, 26th. Snow, 2d.
 1827.—Temperature, none. Frost, 31st.
 1830.—Temperature, 10th, 32. Frost, 5th, 10th, 20th.
 1831.—Temperature, 18th, 32; 21st, 32. Frost, 2d, 8th, 9th, 11th, 22d. Snow, 17th.
 1832.—Temperature, 15th, 30; 16th, 32; 18th, 23–24; 19th, 26. Frost, 2d, 16th, 28th, 29th, 31st.
 1834.—Temperature, 23d, 32. Frost, 14th, 17th, 31st. Ice, 31st. Snow, 3d.
 1836.—Temperature, 3d, 29–30; 12th, 30–31; 13th, 28–29; 16th, 32; 26th, 32. Frost, 4th, 9th, 13th, 16th, 25th, 27th. Snow, 22d.
 1837.—Temperature, 1st, 31; 4th, 22; 5th, 27–28; 6th, 31. Frost, 12th, 17th, 21st. Snow, 3d, 24th.
 1838.—Temperature, 1st, 26; 3d, 30; 4th, 31. Frost, 13th, 24th. Snow, 2d.